Operating and Maintenance Handbook

MARCONI INSTRUMENTS LIMITED, ENGLAND

R-C OSCILLATOR

TYPE [illegible]

OPERATING AND MAINTENANCE HANDBOOK for R-C OSCILLATOR TYPE TF 1101

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431/1

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SCHEDULE OF PARTS SUPPLIED

1. One R-C Oscillator Type TF 1101, complete with valves, etc., as under:-

Valves:	One:	Type 5651 (85A2), Voltage Stabilizer.
	Four:	Type 6AK5 (EF95), Pentodes.
	One:	Type 12AU7, Double Triode.
	Two:	Type 6AQ5, Beam Tetrodes.
	One:	Type 6CD6G, Beam Tetrode.
	One:	Type 5Z4G, Full-Wave Rectifier.
Crystal Diodes:	Two:	Type 1N34 (CG1-E) (CV425), Germanium Diodes.
Lamp:	One:	6.3-volt, 0.15-amp, M.B.C., Pilot Lamp.

2. One Instruction Book No. EB 1101.

1. DESCRIPTION

1.1 GENERAL

The Marconi TF 1101 R-C Oscillator covers from 20 c/s to 200 kc/s in four ranges. It can develop a maximum of 20 volts across a load of 600 ohms or greater. Lower outputs are obtained by means of a continuously-variable level control and a 600-ohm attenuator which is adjustable in seven 10-dB steps; the attenuator, and the meter monitoring its input level, are calibrated in open-circuit output voltage and also in decibels relative to 1 mW developed within a 600-ohm load. By means of oscillator stabilization, the output level, once set, remains virtually constant throughout the frequency range.

The total distortion present in the output is less than 0.5% between 50 c/s and 20 kc/s, and less than 1% outside this range. The distortion is within these limits when the output is fed via the attenuator; it is also within these limits with directly-connected loads down to 600 ohms, except that, below 1000 ohms, the distortion may rise to 1.5% at frequencies above 50 kc/s. A built-in 1-kc/s pass filter can be connected in series with the outlet of the instrument so that, at this frequency, an output having a harmonic content less than 0.1% is available for distortion measurements.

1.2 DESIGN DETAILS

As shown by the Block Schematic Diagram, the instrument consists basically of a two-valve Wien-bridge oscillator followed by amplifier stages leading to a push-pull output stage, a level monitor, and an attenuator. Reference should be made to the Circuit Diagram when reading the circuit descriptions which follow.

1.2.1 Oscillator Circuit

The two oscillator valves are resistance-capacitance coupled pentodes, V5 and V6. Feedback from the anode of V6 is applied across a bridge, the four arms of which consist primarily of (1) the switched resistors R13 - R20 in series with C5a, (2) the switched resistors R21 - R28 in parallel with C5b, (3) the thermistor X1, and (4) resistor R??. The out-of-balance voltage developed by the bridge is applied as input to V5; oscillation takes place at the particular frequency which causes the voltage applied from the junction of arms (1) and (2) to be regenerative in phase.

By altering the values of the components in arms (1) and (2), the frequency of oscillation is adjusted. The four frequency ranges are obtained by switching the resistors. Continuous tuning within each range is effected by the ganged capacitors C5a and C5b. The trimmer capacitors, C7 - C10, parallel with the switched resistors in arm (2), are employed for individual frequency range adjustments.

The thermistor, X1, which makes up the third arm of the bridge, automatically adjusts its value and controls the amplitude of the regenerative out-of-balance voltage so that the output of the oscillator is sinusoidal and has the same level at all frequencies.

The phase shift round the oscillator circuit tends to be modified as the frequency rises towards 200 kc/s; the change occurs mainly at the anode of V5. Compensation for this is provided by the trimmer C6, which is effective in arm (1) of the bridge on the 20- to 200-kc/s range and is adjusted so that the tuning law on this range corresponds to that obtained on the other three ranges.

1.2.2 Amplifier Stages

The output of the oscillator system is fed from the anode of V6 to the cathode follower V7. The cathode circuit of V7 includes a variable potentiometer, RV2, which serves as the SET LEVEL control; at this point it has negligible effect upon the oscillator circuit frequency. The signal developed at the slider of RV2 is

1.2.2 (continued)

applied to a triode amplifier employing half of the double triode V8. This stage is coupled to a phase-splitter circuit using the second half of V8. The two balanced outputs of the phase splitter are applied to the control grids of the two output tetrodes, V9 and V10, in a push-pull transformer-coupled output stage.

Distortion in the amplifier chain is minimized by the use of a push-pull output stage and by negative feedback from the secondary of the output transformer, T2, to the cathode of the first triode, V8a. The use of negative feedback is extended above 20 kc/s by the automatic substitution of a ferrite-cored output transformer, T3, which preserves the feedback voltage in correct phase.

1.2.3 Output Level Control

When the ATTENUATOR switch, SC, is set fully anti-clockwise, there are six attenuator sections between the output transformer and the outlet terminals. As the switch is turned clockwise to the sixth position, five of these attenuator sections are progressively withdrawn. A series 600-ohm resistor alone is inserted between the transformer and the terminals at the seventh position. At each of these first seven positions of the switch, the OUTPUT meter indication represents the source e.m.f., the bridge a.c. voltmeter circuit being connected directly to the output transformer. The seven 10-dB steps of attenuation and the continuously-variable SET LEVEL control, used in conjunction with scales on the meter, provide calibrated open-circuit outputs from 1 mV up to 20 volts at a source impedance of 600 ohms.

At the DIRECT position of the ATTENUATOR switch, the secondary of the output transformer is directly connected to the outlet terminals. The a.c. voltmeter circuit is then in parallel with the terminals and the meter indicates the voltage developed across a load. Up to 20 volts can be obtained across a load of 600 ohms.

The ATTENUATOR switch and the meter are also calibrated in decibels relative to 1 mW, showing the power developed in an external 600-ohm load.

1.2.4 1-kc/s Filter

The 1-kc/s pass filter, contained in the instrument, has its terminals on the front panel and can be linked in series with the normal OUTPUT terminal if required. At the pass frequency, the filter introduces a loss of the order of 30 dB and reduces the harmonic content of the output to less than 0.1%.

The filter consists of a symmetrical T network employing resistors, R84 and R85, in its two series arms and a parallel tuned circuit, L1 and C27, in its shunt arm. The values of the resistors, and the dynamic resistance of the tuned circuit, are such that the input and output impedance is 600 ohms at the pass frequency, and drops only a little at other frequencies; the input and output impedance is predominantly resistive at all frequencies and is substantially independent of the load and source impedance respectively.

1.2.5 Power Supply

The power transformer, T1, has two tapped primary windings which, by series or parallel connection, permit operation from supplies of 200 to 250 volts or 100 to 150 volts, 40 to 100 c/s.

The h.t. supply circuit includes the full-wave rectifier V1, followed by a series stabilizing arrangement consisting of the series regulator V2, its control valve V3 and the reference tube V4.

2 OPERATION

2.1 INSTALLATION

Unless otherwise specified, the R-C Oscillator is normally despatched with its valves in position and with its power transformer tappings adjusted for immediate connection to a 240-volt a.c. supply. The tappings can be adjusted for operation from any supply voltage in the ranges 200 to 250 volts and 100 to 150 volts. To check or alter the settings of the power transformer tappings, the user should refer to MAINTENANCE - Section 4.4.

2.2 SWITCHING ON

Before switching on, be sure that the instrument is correctly adjusted for the voltage of the a.c. supply to be used.

Connect the power lead to the a.c. supply socket; the lead is stowed, when not in use, in clips and a dummy socket at the rear of the instrument. Switch ON by means of the SUPPLY switch. The pilot lamp should glow.

Allow several minutes to elapse for the instrument to warm up. A longer period, say half an hour, should be allowed when the highest stability is required.

2.3 ADJUSTING FREQUENCY

The four consecutive frequency bands covered by the instrument are selected by the four-position RANGE switch. The "c/s" scale on the FREQUENCY dial applies to the first two positions of the switch, and the "kc/s" scale to the second two positions; the scale indication must be multiplied by 10 at the second and fourth positions.

2.3 (continued)

To set the instrument to a particular frequency, turn the RANGE switch to the appropriate position and adjust the FREQUENCY dial to the required frequency.

2.4 ATTENUATED OUTPUT

At the first seven clockwise positions of the ATTENUATOR switch, the source e.m.f., or open-circuit output voltage, is indicated by the OUTPUT meter, read in conjunction with the setting of the ATTENUATOR switch. The effective full-scale voltage reading of the meter is engraved by each position of the switch and the voltage is read off whichever of the two lower meter scales, 0 - 6 or 0 - 20, is appropriate; the colour of each engraving by the switch is in accordance with the colour of the scale which should be used.

For example, if an open-circuit output of 130 mV is required,

(1) set the ATTENUATOR switch to 200 mV (yellow), and

(2) adjust the SET LEVEL control so that the meter indicates "13" on the 0 - 20 scale (yellow).

Except when the 1-kc/s filter is required in circuit, the load should be connected between the left-hand OUTPUT terminal and the EARTH terminal. The source impedance, at the first seven positions of the ATTENUATOR switch, is 600 ohms. At the seventh position, where there is only a series 600-ohm resistor between the meter circuit and the outlet terminals, it is assumed that the SET LEVEL control is adjusted to maintain the meter indication at a given level in order that the voltage drop due to the source impedance of the output transformer - a low value of impedance owing to negative feedback - can be neglected. The output to a load depends upon the impedance of the load, as described in the following subsidiary sections.

2.4.1 Load Impedance: 600 ohms (resistive)

The voltage developed across a 600-ohm resistive load, which matches the source impedance, is half the open-circuit voltage indicated by the ATTENUATOR and meter.

For the particular case of a 600-ohm resistive load, there is a set of dBm figures engraved round the ATTENUATOR switch and a dBm scale on the meter. The figures and the scale are red. Addition of the dBm value indicated by the meter to the dBm figure at the ATTENUATOR position gives the power developed in a 600-ohm resistive load in terms of decibels relative to 1 mW.

2.4.2 Load Impedance: Very High Relative to 600 ohms

The voltage developed across a very high load impedance, exceeding say 100 kΩ, is substantially the open-circuit voltage indicated by the ATTENUATOR and meter. This will usually be the case when the R-C Oscillator is connected directly to the control grid of an amplifier valve, providing the preceding circuit (if any) is disconnected.

However, this direct reading becomes progressively in error for values of load below 100 kΩ. If the load has a purely resistive impedance of 60 kΩ, the voltage across it is of the order of only 1% less than the open-circuit voltage, but with lower values of load the error becomes more serious and the user should refer to Section 2.4.3.

Changes in output level can be read in dB from the dBm scale on the meter and the dBm engravings round the ATTENUATOR switch. Absolute dBm readings, however, are only valid when the load is 600 ohms, as described in Section 2.4.1.

2.4.3 Load Impedance: Neither Very High Nor 600 ohms (resistive)

To determine the voltage developed across a load such as this, recourse must be made to the general expression

2.4.3 (continued)

$$\text{voltage across load} = \frac{E_S \times Z_L}{Z_S + Z_L}$$

where E_S is the source e.m.f., i.e. open-circuit voltage, indicated by the ATTENUATOR and meter.

Z_L is the load impedance, which may consist of resistive and reactive components.

Z_S is the source impedance - in this case, 600 ohms resistance.

In particular, if the load is predominantly resistive, having a value R_L, then

$$\text{voltage across load} = \frac{E_S \times R_L}{600 + R_L}$$

A series of approximate multiplying factors, which can be used to convert the indicated value of source e.m.f. to the actual voltage developed across a resistive load R_L, and which have been derived with the aid of the last expression, are given in Table 1 for a selection of load values.

TABLE 1

Load R_L ohms	Voltage agross R_L is the indicated source e.m.f. multiplied by:-	Load R_L ohms	Voltage across R_L is the indicated source e.m.f. multiplied by:-
60,000	0.99	400	0.40
20,000	0.97	300	0.33
8,000	0.93	200	0.25
4,000	0.87	150	0.20
2,000	0.77	100	0.143
1,000	0.625	75	0.111
800	0.57	50	0.007
0 600	0.50		

2.4.3 (continued)

Changes in output level can be read in dB from the dBm scale on the meter and the dBm engravings round the ATTENUATOR switch. Absolute dBm readings, however, are only valid when the load is 600 ohms, as described in Section 2.4.1.

2.4.4 Increasing the Output Impedance

If it is necessary to present the equipment under test with a source resistance of more than 600 ohms, e.g. to simulate the output impedance of an amplifier stage, then the output resistance of the R-C Oscillator can be increased to the required value R_R by connecting a single resistor R_A in series with the OUTPUT terminal. The value of the resistor which must be added is

$$R_A = R_R - 600 \text{ ohms}$$

When a load R_L is connected to this arrangement

$$\text{voltage across load} = \frac{E_S \times R_L}{600 + R_A + R_L}$$

where E_S is the source e.m.f. indicated by the ATTENUATOR and meter.

2.4.5 Reducing the Output Impedance

If it is necessary to present the equipment under test with a source resistance of less than 600 ohms, then the output resistance of the R-C Oscillator can be made equal to the required value R_R by shunting the OUTPUT terminal to the EARTH terminal with a resistor R_B, where

$$R_B = \frac{600 \times R_R}{600 - R_R} \text{ ohms}$$

2.4.5 (continued)

Under these conditions, the effective source e.m.f., i.e. open-circuit voltage, is

$$E_{SE} = \frac{E_{SI} \times R_B}{600 + R_B} \quad \text{volts}$$

where E_{SI} is the source e.m.f. indicated by the ATTENUATOR and meter.

When a load R_L is connected to this arrangement

$$\text{voltage across load} = \frac{E_{SE} \times R_L}{R_R + R_L}$$

2.5 DIRECT OUTPUT

At the DIRECT position of the ATTENUATOR switch, the meter indicates the voltage between the OUTPUT and EARTH terminals. Therefore, if a load is connected to these terminals, the indicated voltage is that developed across the load. This terminal voltage is read directly on the yellow scale of the meter, full-scale deflection corresponding to 20 volts.

Changes in output level can be read in dB from the red dBm scale on the meter.

Owing to the negative feedback returned over the last three amplifier stages, the output impedance is low relative to 600 ohms. Typically, it may be 70 ohms from 20 c/s to 20 kc/s, rising to 100 ohms at 200 kc/s. However, the optimum value of load is 600 ohms (resistive); lower values of load than this result in greater distortion for the same output power.

Loads which are wholly or partly capacitive may cause oscillation to take place in the amplifier stages over which feedback is returned-

2.5 (continued)

regenerative feedback developing, at an unwanted frequency, over the path of normal negative feedback. Transient oscillation may take place over part of each cycle of output, or the oscillation may be continuous and dominate the output, depending on the composition of the load. As a guide, a purely capacitive load should not exceed 1000 μμF, nor should a resistive load of 600 ohms be shunted by more than 5000 μμF.

2.6 1-kc/s FILTERED OUTPUT

When there is a requirement for an audio signal having a very low harmonic content, e.g. for the purpose of measuring the distortion generated when the signal is passed through an amplifier, the built-in 1-kc/s pass filter should be used. This enables a 1-kc/s signal containing less than 0.1% distortion to be obtained from the R-C Oscillator.

Connect the filter in series with the output of the R-C Oscillator by linking together the left-hand OUTPUT terminal and the 1-kc/s FILTER INPUT terminal. Then take the signal for the equipment under test from the 1-kc/s FILTER OUTPUT terminal and the EARTH terminal.

The filter should be used at exactly its pass frequency. This may not be precisely 1 kc/s. Therefore, when using the filter, set the R-C Oscillator to 1 kc/s and then rock the FREQUENCY control to find the setting at which the equipment under test receives maximum output from the filter.

At its pass frequency, the filter introduces a loss of the order of 30 dB. At all frequencies, its input and output impedance is predominantly resistive and is approximately 600 ohms.

OPERATIONAL SUMMARY

When the user is familiar with the principles and techniques of operation detailed in Section 2, the following abridged instructions may be found a convenient guide for quick reference.

Frequency Range:-
20 c/s - 200 kc/s

Attenuator Output:-
0 - 20 V e.m.f. in 7 ranges; source impedance, 600 Ω.
(-60 to +20 dBm in 600 Ω.)

1-kc/s Filter:-
Output distortion: below 0.1%.
Input and Output Impedance: 600 Ω. Insertion Loss: Of the order of 30 dB.

Direct Output:-
0 - 20 V across load of 600 Ω or greater. (+28 dBm max. in 600 Ω.)

Distortion:-
Via attenuator: Below 0.5% from 50 c/s to 20 kc/s; below 1% at other frequencies.
Direct: See Section 1.

Power Supply:-
200 - 250 V and 100 - 150 V, 40 - 100 c/s.

BEFORE SWITCHING ON

Be sure that the power transformer tappings are correctly set.

LOAD CONNECTIONS

Except when use of 1-kc/s filter is required, connect load to left-hand OUTPUT and EARTH terminals.

ADJUSTING FREQUENCY

Set RANGE switch and FREQUENCY dial so that product of their readings gives required frequency; use "c/s" scale on dial at first two positions of RANGE switch, "kc/s" scale at second two positions.

3 (continued)

ATTENUATED OUTPUT

Set ATTENUATOR switch and adjust SET LEVEL control so that meter indicates required source e.m.f.; use meter scale having same colour as voltage engraving at switch position, taking as full-scale deflection the value engraved. Source impedance is 600 Ω. Red engravings and red meter scale give dBm output when load is 600 Ω.

DIRECT OUTPUT

Set ATTENUATOR switch to DIRECT and adjust SET LEVEL control so that meter indicates, on 0 - 20 (yellow) scale, required voltage across load.

1-kc/s FILTERED OUTPUT

Link left-hand OUTPUT terminal to 1-kc/s FILTER INPUT terminal. Connect load to 1-kc/s FILTER OUTPUT and EARTH terminals. Set R-C Oscillator to 1 kc/s, then readjust FREQUENCY control to obtain maximum output through filter.

4 MAINTENANCE

4.1 GENERAL

The following items are included in this handbook to assist in the maintenance of the R-C Oscillator Type TF 1101:-

Mains Input Connections Diagram
Block Schematic Diagram
Circuit Diagram
Component Layout Illustrations:-
- Front and Rear Panels
- General View (showing covers removed)
- Right-Hand Side (general view)
- Right-Hand Side (oscillator box)
- Left-Hand Side (power supply section and attenuator)
- Left-Hand Side (oscillator and amplifier section)

Spares Ordering Schecule with Circuit References
Valve Replacement Data Sheets

Section 1, DESCRIPTION, in this handbook, deals with the performance and internal circuits of the R-C Oscillator and is intended to be read in conjunction with the Block Diagram and the Circuit Diagram. It is strongly recommended that the user should familiarize himself with this information before commencing the adjustment or replacement of component parts of the instrument.

The Circuit Diagram shows all the electrical components contained in the instrument. The description of these components - their type, value, rating, etc. - is given in the Spares Ordering Schedule; the Schedule also lists certain selected mechanical components.

The physical location of the electrical components is shown by the Component Layout Illustrations.

4.2 FUSES

The TF 1101 is fitted with three fuses. Two of these, FS1 and FS2, are in series with the supply input connections to the power transformer, T1. The third, FS3, is in series with the chassis connection from the centre tap of the h.t. secondary winding of T1. The three fuseholders are accessible at the rear of the instrument.

4.3 REMOVAL OF COVERS

In addition to the front and rear panels, the R-C Oscillator is enclosed by three covers, which together form the top, sides, and bottom of the complete instrument.

To remove these covers:-

(1) Stand the instrument on its front face.

(2) Withdraw the four 2BA screws - two above and two below the supply-lead clips - from the rear panel.

(3) Raising the rear panel and its surround, remove the top cover; then remove the other two covers, which remain standing in the groove behind the front panel and its surround.

(4) To lift off completely the rear panel and its surround, detach the supply lead from its clips and thread it through the panel as the latter is removed. The plug on the supply lead can be passed through the rear panel after removing the transparent cover-plate, which is held in position by one screw.

The covers are reassembled by proceeding in the reverse order to that detailed above; ensure that the covers fit into the groove behind the front panel and surround as this assembly is replaced.

WARNING: When the TF 1101 is switched on, the top cap of V2 carries a high potential.

4.3 (continued)

The illustration MP 1101-2 shows the instrument standing on its face, and the covers removed. In this picture, the rear panel, which has been raised to release the covers, remains lying on the rear end of the chassis.

4.4 SUPPLY INPUT ARRANGEMENTS

For reference while reading the following, open out the Mains Input Connections diagram included after the end of this section.

The R-C Oscillator is fitted with a power transformer, T1, having two separate tapped primary windings. By means of these, the instrument can be set to operate from supplies in the ranges 200 to 250 volts and 100 to 150 volts, 40 to 100 c/s. There are two forms of adjustment: (A) the linking of tags on the transformer to make the instrument suitable for whichever voltage range, of the two above, covers the anticipated supplies, and (B) the tap selection for a particular voltage in the range. In more detail:-

(A) For supplies within the range 200 to 250 volts, the two primary windings must be connected in series by a link between the tags marked "TAP A" and "TAP B" on the transformer.
For supplies within the range 100 to 150 volts, the major sections of the two primary windings must be connected in parallel by a link between the tags marked "100V/200V" and "TAP A", and a link between the tags marked "TAP B" and "OV", on the transformer.

(B) For a particular voltage, within either range, adjustment is made at a separate tapping panel, connected to the transformer but situated at the rear of the instrument. The supply input is carried by two fly leads, which must be screwed to the combination of taps appropriate for the supply voltage. The tapping panel carries a reversible reference plate, marked

4.4 (continued)

on one side with voltages applicable to the 200- to 250-volt range, and on the other with voltages applicable to the 100- to 150-volt range.

Example: For a 210-volt supply, "TAP A" should be linked to "TAP B" on the transformer, the tapping panel reference plate should be positioned to show the markings for the 200- to 250-volt range, and the fly leads should be connected to the "200" and "+10" positions on the panel.

In order to examine fully the transformer connections, remove the covers from the instrument, as described in Section 4.3. If it is only required to view the tapping panel, this can be seen through a transparent cover-plate on the rear panel of the instrument; to alter the position of the fly leads, DISCONNECT THE SUPPLY and remove the cover-plate, which is held in position by a single screw at its top end.

The 180-volt tap, included on the power transformer, is not employed in this instrument.

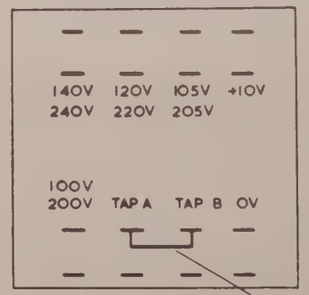
4.5 ACCESS TO OSCILLATOR BOX

The interior of the Oscillator Box is shown in the component layout illustration MP 1101-4.

The majority of the components of the two-valve oscillator circuit and the succeeding cathode follower are screened by enclosure in this box, which is on the right-hand side of the chassis, The valves V5, V6, and V7, included in these circuits, are mounted on the left-hand side of the chassis, where the latter forms one side of the box, so that the tags of the valve holders project within the box.

MAINS INPUT CONNECTIONS

100-150/200-250 VOLTS TRANSFORMERS



200-250 VOLTS MAINS SUPPLIES

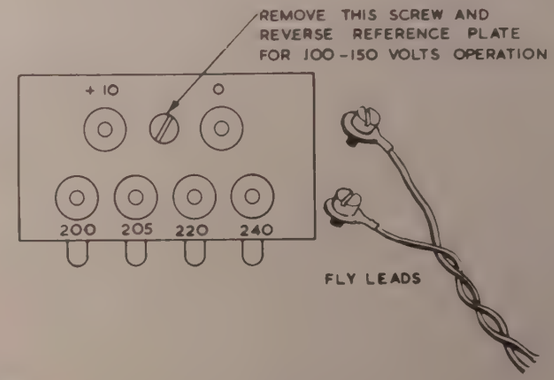
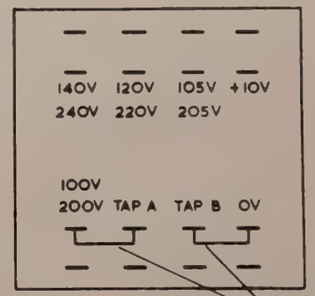
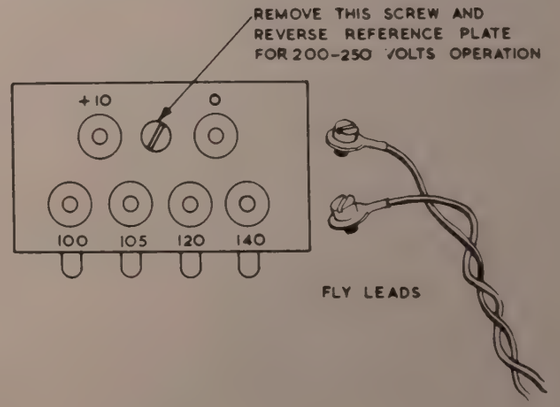


FIGURE 1.

SOLDERED LINK. FOR 100-150 VOLTS OPERATION RECONNECT AS IN FIGURE 2



100-150 VOLTS MAINS SUPPLIES



SOLDERED LINKS. FOR 200-250 VOLTS OPERATION RECONNECT AS IN FIGURE 1

A ARRANGEMENT OF PRIMARY SOLDER TAG CONNECTIONS ON MAINS TRANSFORMER

B MAINS TAPPING PANEL
CONNECT THE FLY-LEADS TO GIVE A COMBINATION TO SUIT MAINS VOLTAGE.
ONE FLY-LEAD MUST GO TO EITHER '+10' OR '0' TAP

FIGURE 2.

MAINS INPUT CONNECTIONS

TLC 27612/1

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4.5 (continued)

To detach the cover, which forms three sides of the box, remove the ten screws that can be seen at the ends - four above the box, two at the side, and four below. Then, draw the cover off the supporting ends of the box, away from the chassis.

When replacing the cover, ensure that the holes through which the oscillator trimmer capacitors can be adjusted are at the bottom, opposite the trimmers.

4.6 WORKING VOLTAGES

The voltages given in Table 2 and Table 3 are for guidance only in maintaining the TF 1101; identical values should not be

TABLE 2

Internal Supply Voltages

Supply	Measured between:-	Voltage
L.T.1.	LT1 tags on transformer T1*	6.3 V a.c.
L.T.2.	LT2 tags on transformer T1*	6.3 V a.c.
L.T.3.	LT3 tags on transformer T1*	5.0 V a.c.
H.T., a.c.	Each HT1 tag on T1 and chassis	340 V a.c.
H.T., rectified	Cathode of V1 and chassis	390 V d.c.
H.T., stabilized (set by RV1)	Cathode of V2 and chassis	250 V d.c.

* WARNING: Tags LT1, LT2, and LT3 on T1 are at a high potential with respect to chassis.

4.6 (continued)

expected on an individual instrument owing to the normal tolerances of valve performance and other circuit values.

The meter employed should be an Avometer Model 8 (20, 000 ohms per volt) or a meter having a similarly high resistance.

The supply voltage must be as near as possible to the value for which the instrument is adjusted.

TABLE 3

Valve Electrode Voltages
(d.c., with respect to chassis)

Valve No.	Anode Volts	Screen Volts	Cathode Volts
V2	390	381	250
V3	230	120	85
V4	85	-	0
V5	163	175	5.8
V6	128	86	1,6
V7	250	250	165
V8a	123	-	3.5
V8b	170	-	83
V9	241	250	18
V10	241	250	18

4.7 REPLACEMENT OF VALVES AND CRYSTALS

The types of valve used in the instrument, their base connections, and some guidance as to suitable alternatives if the types originally fitted are not readily available, are given in the Valve Replacement Data sheets.

All valves and crystals are immediately accessible on removing the covers from the instrument as described in Section 4.3.

With the exception of V6, V9, and V10, the valves and crystals may normally be replaced without special selection. When replacing any of these three, it may be necessary to select the new valve in order to keep the harmonic content of the output within the specified limits; refer to Section 4.9.4 when replacing V6, and refer to Section 4.9.5 when replacing V9 or V10.

Replacement of valves may necessitate either the reselection of associated components or readjustment of associated preset controls; aspects of this are discussed in Section 4.8 - Preset and Specially Selected Components.

4.8 PRESET AND SPECIALLY SELECTED COMPONENTS

In the manufacturing data for the TF 1101, certain of the components are either specified as being of the preset type or designated for individual selection, the setting or selection of the components being carried out during the factory calibration of the instrument; this is necessary since the operating characteristics of the instrument have to conform to a quantitative specification including both maximum and minimum limits.

Components that are preset are described as such in the Spares Ordering Schedule. Components that are individually selected are distinguished by an asterisk against their nominal value in the Schedule.

4.8 (continued)

If, in servicing a TF 1101, it is necessary to replace any of these components, it is also necessary, if the performance or accuracy of the instrument is not to be impaired, to repeat the factory procedure by which the component was originally adjusted or selected.

Again, in any servicing involving the replacement of a valve, or a component which is neither preset nor selected, the user

TABLE 4

Preset Component	Section Describing Adjustment
RV1	4.9.2
RV3	4.9.6
C6	4.9.3
C7	4.9.3
C8	4.9.3
C9	4.9.3
C10	4.9.3

Selected Component	Section describing Selection
R14	4.9.3
R16	4.9.3
R18	4.9.3
R20	4.9.3
R22	4.9.3
R24	4.9.3
R26	4.9.3
R28	4.9.3
R50	4.9.5
R52	4.9.5
R64	4.9.8
C18	4.9.7
C27	4.9.11

4.8 (continued)

should consider carefully the possible effect on the performance of the circuit involved; if the performance has been set previously by means of a preset or selected component, it may be necessary to readjust or reselect that component in addition to replacing the faulty one.

Section 4.9 contains, in a series of subsidiary sections, a range of tests by which the main points of the performance of the instrument can be checked; these sections also deal with the adjustment of preset components and with the choice of value of individually selected components. Table 4 lists the circuit reference numbers of both types of component together with the numbers of the sections in which their adjustment or selection is described.

4.9 SCHEDULE OF TESTS

The following sections, based largely on the internal test schedule to which the instrument was produced, are included to enable the user to carry out a series of tests by which the main points of performance of the instrument can be checked. The sections also give details concerning the adjustment of preset components and the choice of value of individually selected components.

4.9.1 Apparatus Required

a. Multi-range Meter, a.c. and d.c. voltages; e.g. Avometer 8.
b. Variable Mains Supply Transformer; e.g. Variac.
c. Cathode-ray Oscilloscope, preferably with built-in facilities for voltage measurement.
d. Wheatstone Bridge.
e. Audio and Ultrasonic Generator, covering 20 c/s to 100 kc/s; frequency accuracy, 0.2%; e.g. decade oscillator.
f. Wave Analyser; e.g. Marconi Type TF 455 Series.
g. Receiver, with signal strength meter, covering a frequency range extending from the top frequency of Item f up to 600 kc/s.

4.9.1 (continued)

h. Standard Signal Generator, having a frequency range as Item g; e.g. Marconi Type TF 867.
i. Valve Voltmeter; e.g. Marconi Type TF 428 Series or Type TF 1041.
j. Variable Attenuator, 600 ohms; e.g. Marconi Type TF 338B. Standardized to secure maximum accuracy.
k. 600-ohm Load, 1 watt.
l. Decade Capacitor, or fixed and variable capacitors, providing known capacitance of 1000 μμF and 5000 μμF.

4.9.2 H.T. and L.T. Supplies

Apparatus required: Items a, b, and c.

Set the a.c. supply voltage so that it is exactly the value for which the R-C Oscillator is adjusted on its tapping panel.

Adjust the preset variable resistor RV1 so that the stabilized h.t. voltage at the cathode (pin 3) of V2, relative to chassis, is 250 V d.c. Then check that the other internal supply voltages compare satisfactorily with those given in Section 4.6.

Measure the stabilized h.t. voltage at the cathode of V2 while varying the a.c. supply voltage ±10%; the stabilized h.t. should not change more than ±0.5 volt.

Connect the oscilloscope to the stabilized h.t. line (cathode of V2) and examine the ripple waveform; its peak-to-peak amplitude must not exceed 6 mV. (If the oscilloscope does not have facilities for voltage measurement, it must be calibrated beforehand on a known source so that voltages of this order can be measured.)

4.9.3 Adjustment of Oscillator Frequency Ranges

Apparatus required: Items c, d, and e.

(1) Remove the cover of the Oscillator Box, as described in Section 4.5.

4.9.3 (continued)

(2) Apply the waveform available at the OUTPUT terminal (or at the junction of C17 and R43) to one pair of deflecting plates of the oscilloscope, and the output of the decade oscillator to the other pair of plates. With this arrangement, the frequency of the TF 1101 can be checked against that of the decade oscillator by means of the Lissajous figures seen on the oscilloscope.

(3) Turn the RANGE switch to C/S X 10. Adjust resistors R16 and R24 at the l.f. end of the range of the FREQUENCY control, and C8 at the h.f. end, so that the correct output frequencies are obtained when the effective dial indication is 200 c/s and 2000 c/s. If a blank dial is to be calibrated, adjust R16, R24, and C8, so that a coverage in reasonable excess of 200 - 2000 c/s is obtained and then mark the dial at these frequencies.
The total resistance of R15 and R16 must be within ±2% of that of R23 plus R24.

(4) Turn the RANGE switch to C/S X 1. Adjust R14 and R22 at the l.f. end of the range, and C7 at the h.f. end, so that the correct output frequencies are obtained when the dial indicates 20 c/s and 200 c/s. If a blank dial is to be calibrated, these end-of-range frequencies should be obtained at the marks made for 200 c/s and 2000 c/s in (3). R13 plus R14 must be within ±2% of R21 plus R22.

(5) Turn the RANGE switch to KC/S X 1. Adjust R18 and R26 at the l.f. end of the range, and C9 at the h.f. end, so that the correct output frequencies are obtained when the dial indicates 2 kc/s and 20 kc/s. If a blank dial is to be calibrated, these end-of-range frequencies should be obtained at the marks made for 200 c/s and 2000 c/s in (3). R17 plus R18 must be within ±2% of R25 plus R26.

(6) Turn the RANGE switch to KC/S X 10. Adjust R20 and R28 at the l.f. end of the range, and C10 at the h.f. end, so that the correct output frequencies are obtained when the effective dial indication is 20 kc/s and 200 kc/s; C6 should be set to the least capacity that will permit C10 to be

4.9.3 (continued)

satisfactorily adjusted. If a blank dial is to be calibrated, the end-of-range frequencies should be obtained at the marks made for 200 c/s and 2000 c/s in (3).
R19 plus R20 must be within ±2% of R27 plus R28.

(7) Replace the Oscillator Box cover, ensuring that the holes allowing adjustment of the trimmer capacitors are at the bottom of the instrument. Check that, with the cover in position, the correct frequency is still obtained at the h.f. end of each range when the dial is set to the end-of-range position engraved or marked; if necessary, adjust the appropriate trimmer capacitor on each range.

The end-of-range frequency calibrations should be finally checked, or made, when the instrument is known to be satisfactory in other respects and has been fully assembled and switched on for 30 minutes with the correct supply voltage applied. This may form part of a complete check, or calibration, of the whole frequency dial as described in Section 4.9.14.

4.9.4 Oscillator Distortion

Apparatus required: Items f, g, and h.

Usually, it is sufficient to test the overall distortion appearing at the OUTPUT terminal. However, when the overall distortion is excessive, to determine whether the fault lies in the oscillator circuit, the distortion in the output of this stage should be measured.

Take the signal for analysis from the junction of C17 and R43. This point must not be shunted to chassis by the input impedance of the test apparatus if it is low; to prevent this, a series resistor, of say 100 kΩ, should be inserted in series between the TF 1101 and the test apparatus.

The 2nd and 3rd harmonic content at the junction of C17 and R43 should be approximately the same as, or less than, that listed

4.9.4 (continued)

for several operating frequencies in Table 5. These tabulated values are for guidance only, the primary aim being that the harmonic content in the output of the instrument should be within the limits given in Section 4.9.6.

TABLE 5

RANGE switch	FREQUENCY dial	2nd harmonic	3rd harmonic
C/S X 1	60 c/s	0.3%	0.2%
C/S X 1	200 c/s	0.3%	0.2%
C/S X 10	200 c/s	0.3%	0.2%
C/S X 10	2000 c/s	0.3%	0.1%
KC/S X 1	2000 c/s	0.3%	0.1%
KC/S X 1	5000 c/s	0.3%	0.1%
KC/S X 1	20 kc/s	0.8%	0.3%
KC/S X 10	20 kc/s	0.8%	0.3%
KC/S X 10	200 kc/s	0.8%	0.3%

Measurements may be made with the wave analyser, or, at frequencies above the range of the analyser, by means of the receiver; the sensitivity of the latter must be checked against the signal generator at each component frequency.

When replacing V6, it may be necessary to select the new valve in order to obtain sufficiently low levels of harmonic content in the oscillator output.

4.9.5 Output Amplifier: Preliminary Requirements

(i) The anode and cathode loads, R50 and R52, of the phase-splitter amplifier, V8b, must be matched in resistance value to within 3%.

4.9.5 (continued)

(ii) The push-pull output valves, V9 and V10, must be a matched pair. This matching must be preserved if either is replaced. A selection can be carried out on a valve characteristic meter; the pair should be such that, with 225 volts at the anode, 225 volts at the screen grid, and -17.5 volts at the control grid, the higher anode current is within 2% of the lower, and the mutual conductance of one is almost identical with that of the other. Correct pairing of the valves will be confirmed if the output distortion of the instrument as the l.f. end of its range is satisfactorily low in the check described in Section 4.9.6.

4.9.6 Output Distortion and Hum

Apparatus required: Items f, g, and h.

Make distortion and hum measurements at a wide selection of frequencies with (a) the measuring apparatus connected to the OUTPUT and EARTH terminals, (b) the ATTENUATOR switch at DIRECT, and (c) the SET LEVEL control adjusted so that the meter indicates 20 volts.

The output of the TF 1101 should contain less than 0.5% distortion between 50 c/s and 20 kc/s, and less than 1% distortion outside this range. These limits apply when the output is fed via the attenuator, and also with directly-connected loads down to 600 ohms, except that, with directly-connected loads below 1000 ohms the distortion may rise to 1.5% at frequencies above 50 kc/s.

From 200 c/s to 200 kc/s, the hum level should be -60 dB relative to the output signal. Below 200 c/s, there is some rise in the hum level. Adjust the preset variable resistor, RV3, below V1, to minimize the hum. (RV3 was not fitted on early models of TF 1101.)

Measurements may be made with the wave analyser, or, at frequencies above the range of the analyser, by means of the receiver; the sensitivity of the latter must be checked against the signal generator at each component frequency.

4.9.7 Output Frequency Characteristic

(1) Turn the ATTENUATOR switch to DIRECT.

(2) Turn the RANGE switch to C/S X 10 and set the frequency of the TF 1101 to 200 c/s.

(3) Adjust the SET LEVEL control so that the meter indicates 0 dBm.

(4) Vary the frequency of the TF 1101 over its entire range, 20 c/s to 200 kc/s, noting the meter reading on the dBm scale.

The output should remain constant within ±0.5 dB of the level set at 200 c/s. If the instrument does not satisfy this requirement towards the higher end of its range, the response should be flattened by adjustment of the value of C18, in the cathode circuit of V7.

4.9.8 Meter Sensitivity and Linearity

Apparatus required: Item i.

For this test, the errors of the valve voltmeter employed must be known so that measurements at 4, 8, 12, 16, and 20 volts can be made with high accuracy.

(1) Connect the valve voltmeter across the OUTPUT and EARTH terminals.

(2) Turn the ATTENUATOR switch to DIRECT.

(3) With the RANGE switch at C/S X 10, set the frequency of the TF 1101 to 200 c/s.

(4) With the covers off the instrument, adjust the value of R64 (by substitution or addition) so that the meter on the TF 1101 reads 20 volts when the true output is 19.8 volts.

4.9.8 (continued)

The error introduced in (4), whereby the indication is made 1% high while the covers are off, is compensation for the effect of higher temperature in the instrument when the covers are on.

When the covers are on the instrument, check that the true output agrees reasonably with the indication when the latter is 4, 8, 12, and 16 volts, as well as confirming that the accuracy is satisfactory at 20 volts. Make this test at 200 c/s and 200 kc/s.

4.9.9 Attenuator Accuracy

Apparatus required: Items f and j.

(1) Connect the 600-ohm attenuator between the outlet terminals (OUTPUT and EARTH) of the TF 1101 and the wave analyser. The latter serves as a sensitive indicator in this test.

(2) Adjust the external attenuator to 70 dB.

(3) Set the TF 1101 to a frequency of 1 kc/s.

(4) Turn the ATTENUATOR switch to 20 V (+ 20 dBm).

(5) Adjust the SET LEVEL control so that the meter of the TF 1101 indicates 20 volts.

(6) Adjust the wave analyser to obtain a convenient reference indication.

(7) Turn the ATTENUATOR switch counter-clockwise so that the output of the TF 1101 is reduced in steps of nominally 10 dB. At each step, first ensure that the TF 1101 meter reads 20 volts (readjusting the SET LEVEL control if necessary), then adjust the external attenuator to restore the reference indication on the wave analyser.

In general, it should be found that each step of the ATTENUATOR switch requires to be offset by a change in the external attenuator of 10 dB within approximately ±0.5 dB, and that the overall change of output level from the TF 1101 is 60 dB within approximately ±1.0 dB.

4.9.10 Stability

Apparatus required: Items c, k, and l.

(1) Connect the capacitor, set to minimum, across the left-hand OUTPUT and EARTH terminals. Also, connect the oscilloscope across these terminals.

(2) Turn the ATTENUATOR switch to DIRECT and adjust the SET LEVEL control to 20 volts.

(3) With the RANGE switch set in turn to KC/S X 1 and KC/S X 10, increase the capacity from minimum until the onset of instability is seen on the waveform displayed on the oscilloscope.

At both settings of the RANGE switch, it should be possible to make the capacitive load exceed 1000 μμF before instability occurs.

(4) Connect the 600-ohm load across the OUTPUT and EARTH terminals, in parallel with the capacitor and the oscilloscope.

(5) With the RANGE switch set in turn to KC/S X 1 and KC/S X 10, increase the capacity from minimum until the onset of instability is seen on the waveform displayed on the oscilloscope.

At both settings of the RANGE switch, it should be possible to make the parallel capacitive component of the load exceed 5000 μμF before instability occurs.

4.9.11 1-kc/s Filter: Frequency

Apparatus required: Items i and k.

(1) Connect the internal 1-kc/s pass filter in series with the output of the TF 1101 by linking the left-hand OUTPUT terminal to the 1-kc/s FILTER INPUT terminal.

(2) Connect the 600-ohm load and the valve voltmeter in parallel across the 1-kc/s FILTER OUTPUT and EARTH terminals.

4.9.11 (continued)

(3) Turn the ATTENUATOR switch to 20 V (+20 dBm).

(4) Set the RANGE switch to C/S X 10 and adjust the frequency of the TF 1101, close to 1000 c/s, until maximum output is indicated by the valve voltmeter.

The frequency, as indicated by the dial of the TF 1101, at which the filter passes maximum output may be expected to lie within approximately 100 c/s of 1000 c/s. If necessary, select a capacitor for position C27, so that the frequency is brought within the required limits.

4.9.12 1-kc/s Filter: Insertion Loss

Apparatus required: Items i and k.

(1) Set the TF 1101 to a frequency of 1000 c/s.

(2) Connect the valve voltmeter and the 600-ohm load in parallel across the left-hand OUTPUT and EARTH terminals.

(3) Turn the ATTENUATOR switch to 600 mV (-10 dBm) and adjust the SET LEVEL control so that the meter on the TF 1101 reads -2 dB on the dBm scale.

(4) Adjust the range selector on the valve voltmeter to obtain a convenient reference reading.

(5) Transfer the connections of the 600-ohm load and the valve voltmeter from the left-hand OUTPUT terminal to the 1-kc/s FILTER OUTPUT terminal. Link the left-hand OUTPUT terminal to the 1-kc/s FILTER INPUT terminal.

(6) Turn the ATTENUATOR switch to 20 V (+20 dBm). Adjust the frequency of the TF 1101 to obtain maximum deflection on the valve voltmeter. Then, adjust the SET LEVEL control to restore the indication of the valve voltmeter to the reference level previously obtained in (4).

4.9.12 (continued)

The difference in output from the TF 1101, as indicated by the ATTENUATOR switch and the dBm scale on the meter, between (4) and (6) is the insertion loss of the filter; it should be 31 dB within approximately ±2 dB.

4.9.13 1-kc/s Filter: Distortion in Output

Apparatus required: Items f and k.

(1) Link the left-hand OUTPUT terminal to the 1-kc/s FILTER INPUT terminal. Connect the 600-ohm load and the wave analyser in parallel across the 1-kc/s FILTER OUTPUT and EARTH terminals.

(2) Turn the ATTENUATOR switch to DIRECT.

(3) Adjust the frequency of the TF 1101, close to 1000 c/s, until maximum output through the filter is obtained, as indicated by the wave analyser.

(4) Adjust the SET LEVEL control so that the meter reads 20 volts.

(5) Measure the output of the filter at its pass frequency and at the 2nd and 3rd harmonics of the pass frequency.

The total harmonic content in the output of the filter must not exceed 0.1%.

4.9.14 Frequency Dial Calibration

Apparatus required: Items b, c, and e.

The following procedure may be employed to check the accuracy of an existing calibrated dial on the instrument or to calibrate a blank dial it if has been necessary to replace the original one. The frequency coverage of each range should previously have been checked, or set, as described in Section 4.9.3.

4.9.14 (continued)

(1) Apply the mains voltage for which the TF 1101 is adjusted and allow the instrument to warm up for 30 minutes. The covers should be on the instrument.

(2) Apply the waveform available at the OUTPUT and EARTH terminals to one pair of deflecting plates in the oscilloscope and apply the output of the decade oscillator to the other pair of plates.

(3) By reference to the Lissajous figures displayed on the oscilloscope, check that the accuracy of the dial calibration on all ranges is within ±1% ±1 c/s; if the calibration error exceeds these limits on any range, it may be possible to reduce the error to an acceptable value by appropriate readjustment of the coverage of the range as described in Section 4.9.3.

If a blank dial is to be calibrated, switch the instrument to the 200- to 2000-c/s range. Then, by reference to the Lissajous figures on the oscilloscope, mark the blank dial at every 5 c/s from 200 c/s to 300 c/s, every 10 c/s from 300 c/s to 1000 c/s, every 20 c/s from 1000 c/s to 1500 c/s, and every 50 c/s from 1500 c/s to 2000 c/s. Subsequently, the outer scale of the dial should be engraved in accordance with these marks. The inner scale is obtained by projection of the outer scale.

AMENDMENT SHEET No. 431/1

Operating and Maintenance Handbook

for

R-C Oscillator Type TF 1101

(A) Circuit Diagram TLC 25246, Illustration MF 1101-5, and Spares Ordering Schedule Sheet 4: Two 220-ohm 3-watt resistors, one connected between each anode of the rectifier valve V1 and the H. T. winding on transformer T1, have been added to some instruments having serial numbers above JA 431/001.

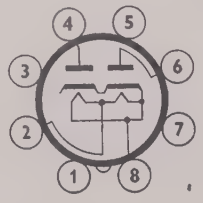
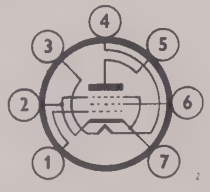
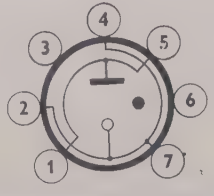
(B) When the resistors referred to in (A) are fitted, the cathode voltage of V1 and the anode voltage of V2, shown in Tables 2 and 3 respectively, should then read 360 volts.

VALVE REPLACEMENT DATA

FOR

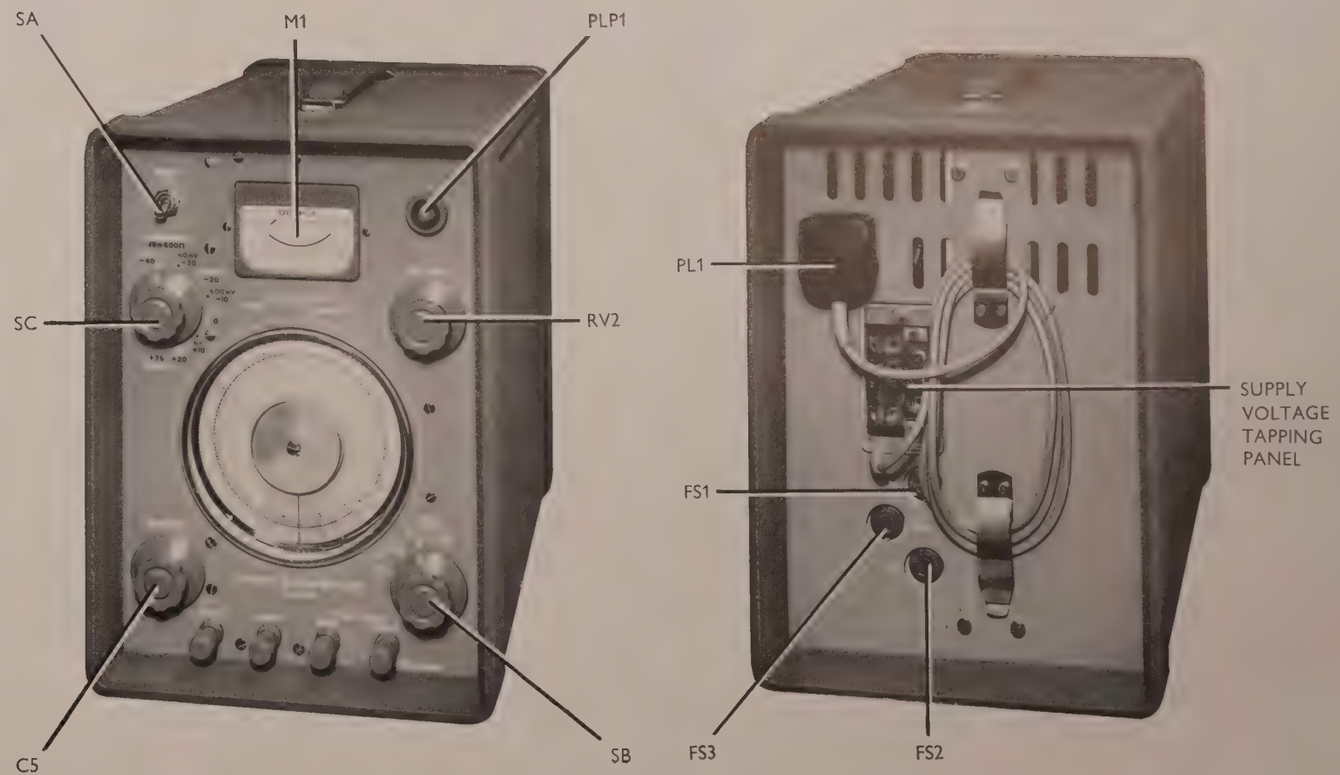
R-C OSCILLATOR Type TF 1101

Any valve which becomes faulty should preferably be replaced by a valve of the type originally supplied in the instrument and designated in the following table. If this is not possible, the additional data given by the table may be used as a guide to suitable alternatives.

Valve	*British Commercial Equivalent*	*British Services Equivalent*	*Base*	*U.S. Equivalent*
V1 FULL-WAVE RECTIFIER BRIMAR 5Z4G	R52 52KU	CV1863	INTERNATIONAL OCTAL 	5Z4G
V2 TETRODE BRIMAR 6CD6G			INTERNATIONAL OCTAL	6CD6G
V3, V5, V6, V7, PENTODE MULLARD EF95		CV850	MINIATURE 7-PIN (B7G) 	6AK5
V4 VOLTAGE STABILIZER MULLARD 85A2	QS83/3 QS1209	CV449	MINIATURE 7-PIN (B7G) 	5651

Valve	*British Commercial Equivalent*	*British Services Equivalent*	*Base*	*U.S. Equivalent*
V8 DOUBLE TRIODE BRIMAR 12AU7	ECC82	CV491	MINIATURE 9-PIN (B9A) 	12AU7
V9, V10 TETRODE BRIMAR 6AQ5	EL90	CV1862	MINIATURE 7-PIN (B7G) 	6AQ5

FRONT AND REAR PANELS



FRONT AND REAR PANELS

MARCONI INSTRUMENTS LIMITED							
DRN	D.H.	DATE	1/57	CHKD	D.P.E.B.	ISSUE	1
STOCK LIST	TF 1101			DRG No.	MP 1101—▌		

GENERAL VIEW

SHOWING COVERS REMOVED

MARCONI INSTRUMENTS LIMITED							
DRN	D.H.	DATE	1/57	CHKD	D.P.E.B.	ISSUE	1
STOCK LIST	TF 1101			DRG No.	MP 1101—**2**		

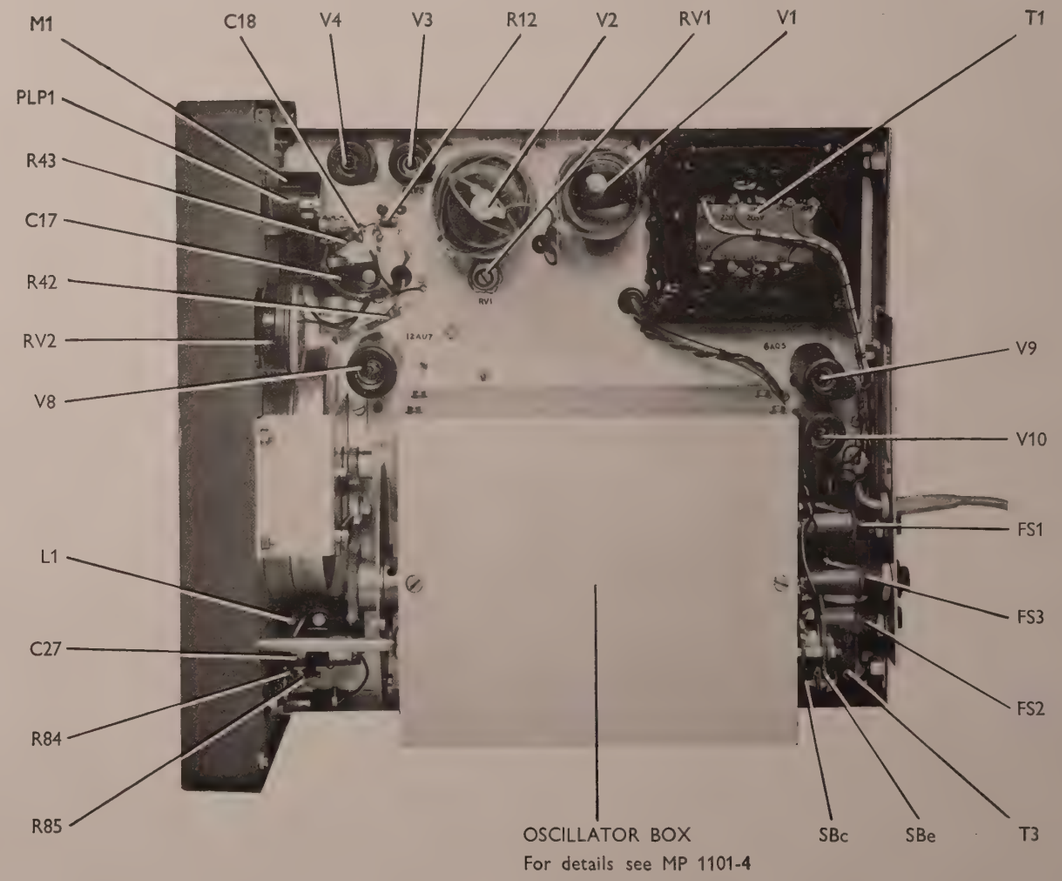
GENERAL VIEW

SHOWING COVERS REMOVED

RIGHT-HAND SIDE
GENERAL VIEW

(1) The mechanical coupling between the variable capacitor shaft and the frequency dial consists of a wire-drive in place of the gear wheels shown.

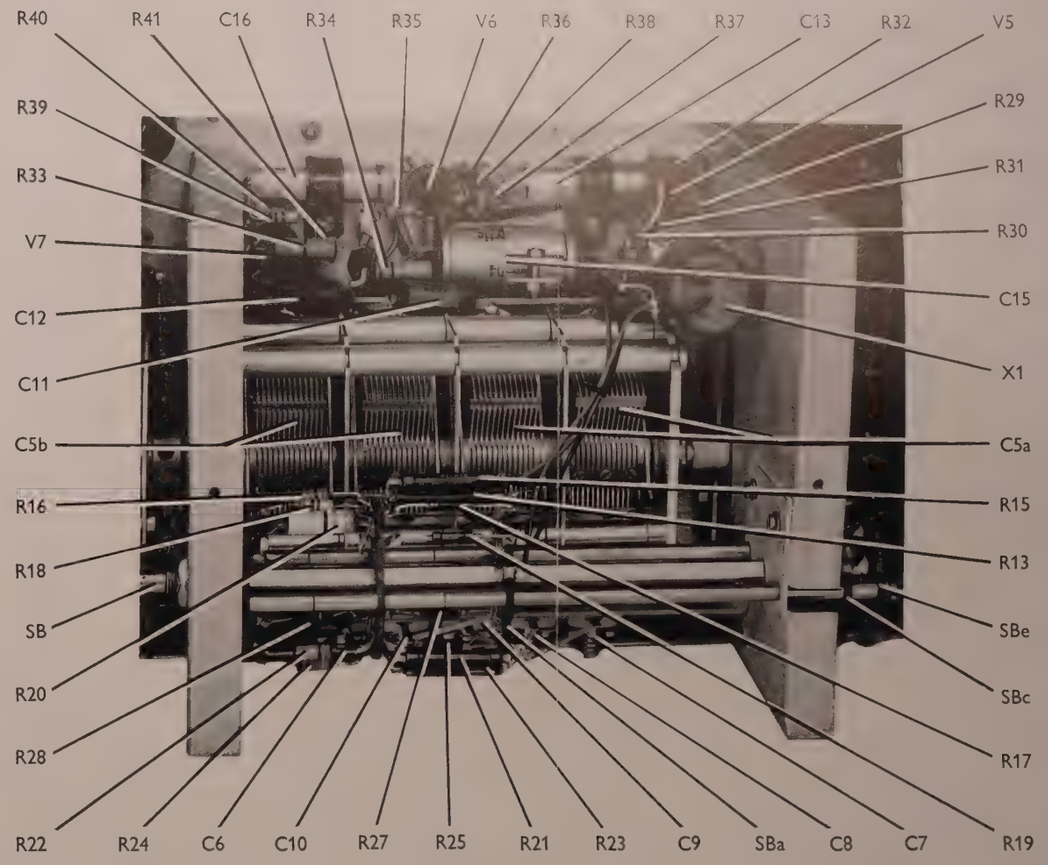
(2) An additional preset potentiometer, RV3, is fitted below V1 and next to RV1.



RIGHT-HAND SIDE
GENERAL VIEW

MARCONI INSTRUMENTS LIMITED							
DRN	D.H.	DATE	1/57	CHKD	D.P.E.B.	ISSUE	1
STOCK LIST	TF 1101			DRG No.	MP 1101—3		

RIGHT-HAND SIDE
OSCILLATOR BOX



RIGHT-HAND SIDE
OSCILLATOR BOX

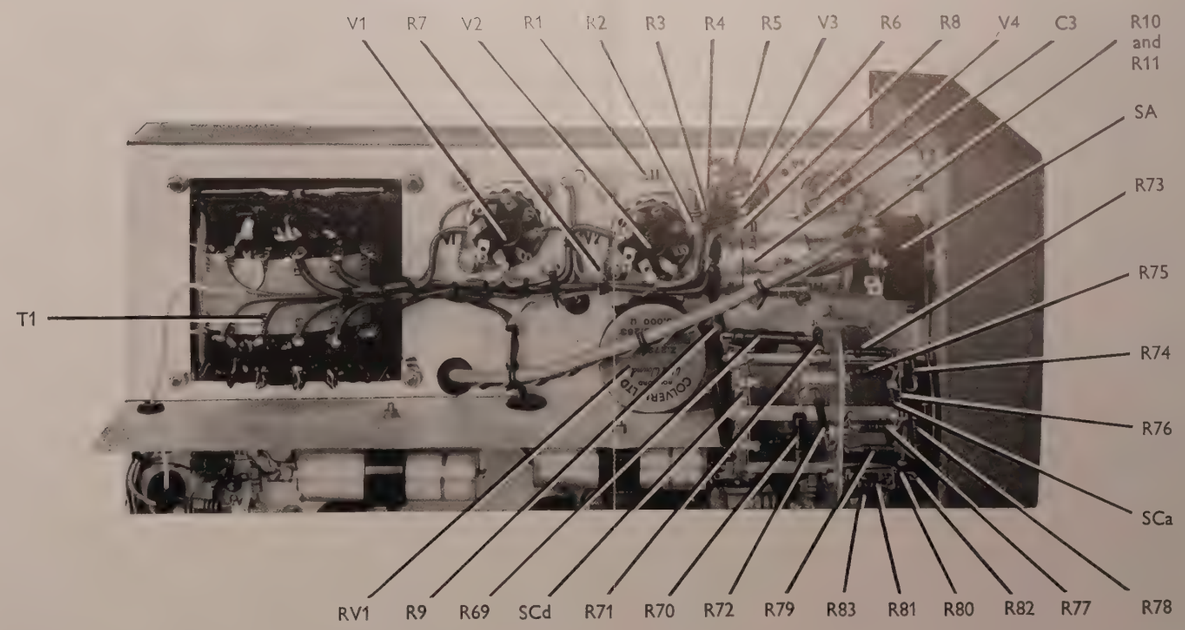
MARCONI INSTRUMENTS LIMITED							
DRN	D.H.	DATE	1/57	CHKD	D.P.E.B.	ISSUE	1
STOCK LIST	TF 1101			DRG No.	MP 1101—4		

LEFT-HAND SIDE

POWER SUPPLY SECTION AND ATTENUATOR

(1) The resistor R11, shown in parallel with R10, is no longer fitted.

(2) An additional preset potentiometer, RV3, is fitted below V1 and next to RV1.



LEFT-HAND SIDE

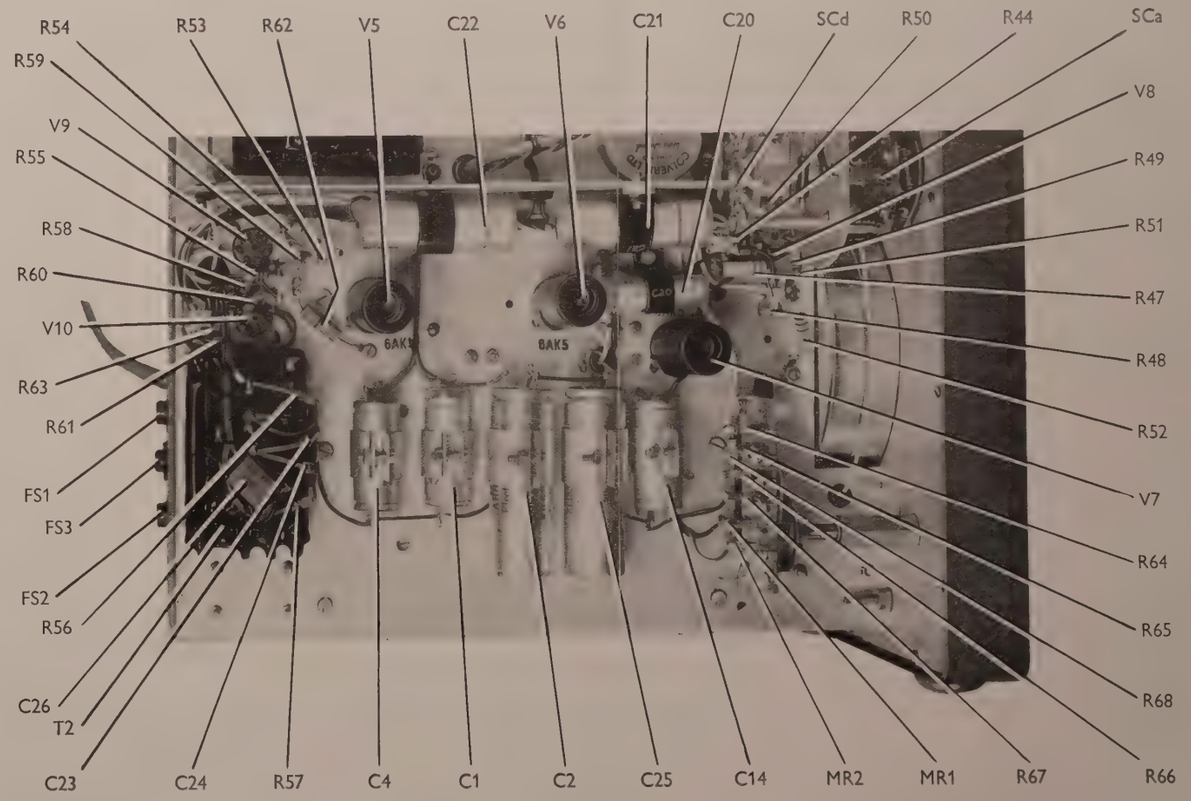
POWER SUPPLY SECTION AND ATTENUATOR

MP 1101—5

MARCONI INSTRUMENTS LIMITED							
DRN	D.H.	DATE	1/57	CHKD	D.P.E.B.	ISSUE	1
STOCK LIST	TF 1101			DRG No.	MP 1101—5		

LEFT-HAND SIDE

OSCILLATOR AND AMPLIFIER SECTION



LEFT-HAND SIDE

OSCILLATOR AND AMPLIFIER SECTION

MARCONI INSTRUMENTS LIMITED							
DRN	D.H.	DATE	1/57	CHKD	D.P.E.B.	ISSUE	1
STOCK LIST	TF 1101			DRG No.	MP 1101—6		

SPARES ORDERING SCHEDULE NO. SOS/1101

WITH CIRCUIT REFERENCES

for

R-C OSCILLATOR TYPE TF 1101

Applicable to Instruments Serial Nos:-
5159001 to 5159100
JA.29/001 to JA.29/100
JA.117/001 to JA.117/100
JA. 235/001 to JA.235/200
JA. 431/001 to JA.431/200

When ordering replacement parts, ALWAYS QUOTE THE TYPE NUMBER AND SERIAL NUMBER OF THE INSTRUMENT CONCERNED.

To specify the individual parts required, STATE FOR EACH PART THE QUANTITY REQUIRED AND THE APPROPRIATE SOS ITEM NUMBER.

For example, to order replacements for the 100-ohm resistor, R2, and the 47-μμF capacitor, C11, quote as follows:-

Spares required for TF 1101, Serial No. 000000

1 off, SOS Item 2
1 off, SOS Item 98

It is important that the distinguishing code "SOS", preceding each item number, should not be omitted.

SOS Item No.	Circuit Ref.	Description	Works Ref.
		FIXED RESISTORS	
1	R1	Composition, 1 kΩ±10%, ½W.	PC66614/13
2	R2	Composition, 100 Ω± 10%, ½W.	PC66614/1
3	R3	Composition, 4.7 kΩ± 10%, ½W.	PC66614/21
4	R4	Composition, 680 kΩ± 10%, ½W.	PC66614/47
5	R5	Composition, 330 kΩ± 10%, ½W.	PC66614/43
6	R6	Composition, 47 kΩ± 10%, ½W.	PC66614/33
7a	R7	Composition, 100 kΩ± 10%, ½W.	PC66611/49
8	R8	Composition, 1 kΩ± 10%, ½W.	PC66614/13
9	R9	Composition, 47 kΩ±10%, ½W.	PC66614/33
10a	R10	Composition, 68 kΩ± 10%, ½W.	PC66614/35
11			
12	R12	Composition, 10 Ω± 10%, ½W.	19-TF1101
13	R13	Carbon, High Stability, 6.2 MΩ±2%, 3/4 W.	20-TF1101
14	R14	Composition, 820 kΩ*, ½W.	PC66614/48
15	R15	Carbon, High Stability, 620 kΩ±2%, 3/4 W.	22-TF1101
16	R16	Composition, 82 kΩ*, ½W.	PC66614/36

* Nominal value; actual value determined by test procedure.

SOS Item No.	Circuit Ref.	Description	Works Ref.
		FIXED RESISTORS (continued)	
33	R33	Composition, 3.3. kΩ ± 10%, 1 W.	PC66615/31
34	R34	Composition, 10 kΩ ± 10%, 1W.	PC66615/37
35	R35	Composition, 47 kΩ ± 10%, ½W.	PC66614/33
36	R36	Composition, 4.7 kΩ ± 10%, ½W.	PC66614/21
37	R37	Composition, 680 kΩ ± 10%, ½W.	PC66614/47
38	R38	Composition, 150 Ω ± 10%, ½W.	PC66614/3
39	R39	Composition, 1 MΩ ± 10%, ½W.	PC66614/49
40	R40	Composition, 4.7 kΩ ± 10%, ½W.	PC66614/21
41	R41	Composition, 220 Ω ± 10%, ½W.	PC66614/5
42	R42	Composition, 22 kΩ ± 10%, 1W.	PC66615/41
43	R43	Composition, 68 kΩ ± 10%, ½W.	PC66614/35
44	R44	Composition, 1 kΩ ± 10%, ½W.	PC66614/13
45	R45	Composition, 680 Ω ± 10%, ½W.	PC66614/11
46	R46	Composition, 3.3 kΩ ± 10%, ½W.	PC66614/19
47	R47	Composition, 22 kΩ ± 10%, 1W.	PC66615/41
48	R48	Composition, 1 MΩ ± 10%, ½W.	PC66614/49
49	R49	Composition, 1 kΩ ± 10%, ½W.	PC66614/13

SOS Item No.	Circuit Ref.	Description	Works Ref.
		FIXED RESISTORS (continued)	
50	R50	Composition, 22 kΩ*, 1W.	PC66615/41
51	R51	Composition, 680 Ω ± 10%, ½W.	PC66614/11
52	R52	Composition, 22 kΩ*, 1W.	PC66615/41
53	R53	Composition, 470 kΩ ± 10%, ½W.	PC66614/45
54	R54	Composition, 1 kΩ ± 10%, ½W.	PC66614/13
55	R55	Composition, 100 Ω ± 10%, ½W.	PC66614/1
56	R56	Composition, 2.2 kΩ ± 10%, ½W.	PC66614/17
57	R57	Composition, 2.2 kΩ ± 10%, ½W.	PC66614/17
58	R58	Composition, 100 Ω ± 10%, ½W.	PC66614/1
59	R59	Composition, 47 Ω ± 10%, ½W.	51-TF1101
60	R60	Composition, 47 Ω ± 10%, ½W.	51-TF1101
61	R61	Composition, 1 kΩ ± 10%, ½W.	PC66614/13
62	R62	Composition, 330 Ω ± 10%, 1W.	PC66615/19
63	R63	Composition, 470 kΩ ± 10%, ½W.	PC66614/45
64	R64a	Composition, 1.8 kΩ*, ½W.	PC66614/16
65	R65	Carbon, High Stability, 22 kΩ ± 2%, 1/4W.	8-TM5285

* Nominal value; actual value determined by test procedure.

SOS Item No.	Circuit Ref.	Description	Works Ref.
		FIXED RESISTORS (continued)	
66	R66	Composition, 330 Ω ± 5%, ½W.	9-TM5285
67	R67	Composition, 330 Ω ± 5%, ½W.	9-TM5285
68	R68	Composition, 10 kΩ ± 10%, ½W.	PC66614/25
69	R69	Carbon, High Stability, 600 Ω ± 1%, 3/4W.	50-TF1101
70	R70	Carbon, High Stability, 1.2 kΩ ± 1%, ½W.	53-TF1101
71	R71	Carbon, High Stability, 571 Ω ± 1%, 1/4W.	44-TF1101
72	R72	Carbon, High Stability, 5310 Ω ± 1%, 1/4W.	45-TF1101
73	R73	Carbon, High Stability, 1610 Ω ± 1%, 1/4W.	46-TF1101
74	R74	Carbon, High Stability, 1707 Ω ± 1%, 1/4W.	47-TF1101
75	R75	Carbon, High Stability, 1155 Ω ± 1%, 1/4W.	48-TF1101
76	R76	Carbon, High Stability, 1707 Ω ± 1%, 1/4W.	47-TF1101
77	R77	Carbon, High Stability, 1155 Ω ± 1%, 1/4W.	48-TF1101
78	R78	Carbon, High Stability, 1707 Ω ± 1%, 1/4W.	47-TF1101
79	R79	Carbon, High Stability, 1155 Ω ± 1%, 1/4W.	48-TF1101
80	R80	Carbon, High Stability, 1707 Ω ± 1%, 1/4W.	47-TF1101
81	R81	Carbon, High Stability, 1155 Ω ± 1%, 1/4W.	48-TF1101
82	R82	Carbon, High Stability, 1707 Ω ± 1%, 1/4W.	47-TF1101

SOS Item No.	Circuit Ref.	Description	Works Ref.
		FIXED RESISTORS (continued)	
83	R83	Carbon, High Stability, 790 Ω ± 1%, 1/4W.	49-TF1101
84	R84	Carbon, High Stability, 570 Ω ± 1%, 3/4W.	54-TF1101
85	R85	Carbon, High Stability, 570 Ω ± 1%, 3/4W.	54-TF1101
		VARIABLE RESISTORS	
86	RV1	Wire-Wound, 50 kΩ ± 10%, 1 W. Preset.	PC67402/49
87	RV2	Wire-Wound, 50 kΩ ± 10%, 1 W.	PC67402/50
87/1	RV3	Wire-Wound, 100 Ω ± 10%, ½W. Preset.	PC67401/9
		CAPACITORS	
88	C1	Electrolytic, 8μF -20% +50%, 450 V d.c.	PC18406/2

SOS Item No.	Cir - cuit Ref.	Description	Works Ref.
		CAPACITORS (continued)	
89	C2	Electrolytic, 32 µF -20% +50%, 450 V d.c.	PC18407/1
90	C3	Paper, 0.25 µF ±20%, 350 V d.c.	PC19202/16
91	C4	Electrolytic, 8 µF -20% +50%, 450 V d.c.	PC18406/2
92	C5	Air, Variable, 4-gang, 523 µµF swing per sect.	64-TF1101
93	C6	Air, Variable, 3 to 19.5 µµF. Preset.	65-TF1101
94	C7	Air, Variable, 3 to 19.5 µµF. Preset.	65-TF1101
95	C8	Air, Variable, 3 to 19.5 µµF. Preset.	65-TF1101
96	C9	Air, Variable, 3 to 19.5 µµF. Preset.	65-TF1101
97	C10	Air, Variable 3 to 19.5 µµF. Preset.	65-TF1101
98	C11	Mica, 47 µµF ±5%, 350 V d.c.	66-TF1101
99	C12	Mica, 39 µµF ±5%, 350 V d.c.	67-TF1101
100	C13	Paper, 0.1 µF ±20%, 350 V d.c.	PC19202/14
101	C14	Electrolytic, 8µF -20% +50%, 450 V d.c.	PC 18406/2
102	C15	Electrolytic, 8 µF -20% +50% 450 V d.c.	PC18406/2
103	C16	Paper, 0.1 µF ±20%, 350 V d.c.	PC19202/14
104	C17	Paper, 1 µF ±25%, 150 V d.c.	PC19301/4
105	C18	Ceramic, 6.8 µµF ± 10%, 500 V d.c.	PC18201/7

SOS Item No.	Circuit Ref.	Description	Works Ref.
		CAPACITORS (continued)	
106	C19	Ceramic, 22 μμF ±10%, 500 V d.c.	PC18202/5
107	C20	Paper, 0.1 μF ±20%, 350 V d.c.	PC19203/14
108	C21	Paper, 0.5 μF ±20%, 350 V d.c.	PC19203/19
109	C22	Paper, 0.5 μF ± 20%, 350 V d.c.	PC19202/19
110	C23	Paper, 0.001 μF ±20%, 600 V d.c.	73-TF1101
111	C24	Paper, 0.001 μF ±20%, 600 V d.c.	73-TF1101
112	C25	Electrolytic, 32 μF -20% +50%, 450 V d.c.	PC18407/1
113	C26	Mica, 330 μμF ±5%, 350 V d.c.	60-TF1101
114	C27	Electrolytic, 25 μF -20% +50%, 12 V d.c.	8-TM5178

SOS Item No.	Circuit Ref.	Description	Works Ref.
		TRANSFORMERS AND INDUCTORS	
115	T1	Power Transformer.	TM5150/11
116	T2	Output Transformer (20 c/s - 20 kc/s).	TM5135/2
117	T3	Output Transformer (20 kc/s - 200 kc/s).	TM5216
118	L1	Filter Inductor.	1-2-3-5-6 TM5178
		VALVES, HOLDERS, AND RETAINERS	
119	V1	5Z4G, Full-Wave Rectifier.	149-TF1101
120		Holder, for V1.	PC81814/1
121		Retainer, for V1.	TC22744/12
122	V2	6CD6G, Tetrode.	150-TF1101
123		Holder, for V2.	PC81814/1
124		Retainer, for V2.	TC22744/57
125	V3	EF95 (6AK5), Pentode.	145-TF1101
126		Holder, for V3	117-TF1101
127		Can/Retainer, for V3.	PC17501/1

SOS Item No.	Circuit Ref.	Description	Works Ref.
		VALVES, HOLDERS, AND RETAINERS (continued)	
128a	V4	5651, Voltage Stabilizer.	146-TF1101
129		Holder, for V4.	117-TF1101
130a		Can/Retainer, for V4.	PC17501/2
131	V5	EF95 (6AK5), Pentode.	145-TF1101
132		Holder, for V5.	117-TF1101
133		Can/Retainer, for V5.	PC17501/1
134	V6	EF95 (6AK5), Pentode.	145-TF1101
135		Holder, for V6.	117-TF1101
136		Can/Retainer, for V6.	PC17501/1
137	V7	EF95 (6AK5), Pentode.	145-TF1101
138		Holder, for V7.	117-TF1101
139		Can/Retainer, for V7.	PC17501/1
140	V8	12AU7, Double-Triode.	147-TF1101
141		Holder, for V8.	118-TF1101
142		Can/Retainer, for V8.	PC17502/2
143	V9	6AQ5, Beam Tetrode.	148-TF1101
144		Holder, for V9.	117-TF1101

SOS Item No.	Circuit Ref.	Description	Works Ref.
		VALVES, HOLDERS, AND RETAINERS (continued)	
145		Can/Retainer, for V9.	PC17501/3
146	V10	6AQ5, Beam Tetrode.	148-TF1101
147		Holder, for V10.	117-TF1101
148		Can/Retainer, for V10.	PC17501/3
148/1a		Top Cap Connector, for V2.	205-TF1101
		CRYSTAL DIODES	
149	MR1	CG1-E (CV425), Germanium Crystal Rectifier.	5-TM5285
150	MR2	CG1-E (CV425), Germanium Crystal Rectifier.	5-TM5285

SOS Item No.	Circuit Ref.	Description	Works Ref.
		THERMISTORS	
151	X1	Stantel Type A1522/100.	4-TM5179
152		Thermistor Assembly; including Item 151.	TM5179
		LAMPS AND HOLDERS	
153	PLP1	Pilot Lamp, Miniature Bayonet Cap (Centre Contact), 6.3-V, 0.15-A.	80-TF1101
154		Pilot Lamp Holder; including red lens.	79-TF1101
		FUSES AND HOLDERS	
155	FS1	Cartridge, 3-A.	115-TF1101
156		Holder, for FS1.	TB24330/1
157	FS2	Cartridge, 3-A.	115-TF1101
158		Holder, for FS2.	TB24330/1
159	FS3	Cartridge, 250-mA.	116-TF1101
160		Holder, for FS3.	TB24330/1

SOS Item No.	Circuit Ref.	Description	Works Ref.
		METERS	
161	M1	Moving Coil, 200-μA f. s. d., 500-Ω (nominal), Special Scale; including clamping brakets.	TM5170/1
		PLUGS, SOCKETS, TERMINALS, AND CONNECTING LEADS	
162		Mains Lead, complete with Plug, Item 163, and Crommet-Sleeve, Item 164.	TM2560BG
163	PL1	Plug, 3-pin, 5-A; included in Item 162.	1-TM2560BG
164		Grommet-Sleeve; included in Item 162.	4-TM2560BG
165		EARTH Terminal.	TB24330/5
166		OUTPUT Terminal.	TB24330/5
167		1-kc/s FILTER INPUT Terminal.	TB24330/5
168		1-kc/s FILTER OUTPUT Terminal.	TB24330/5

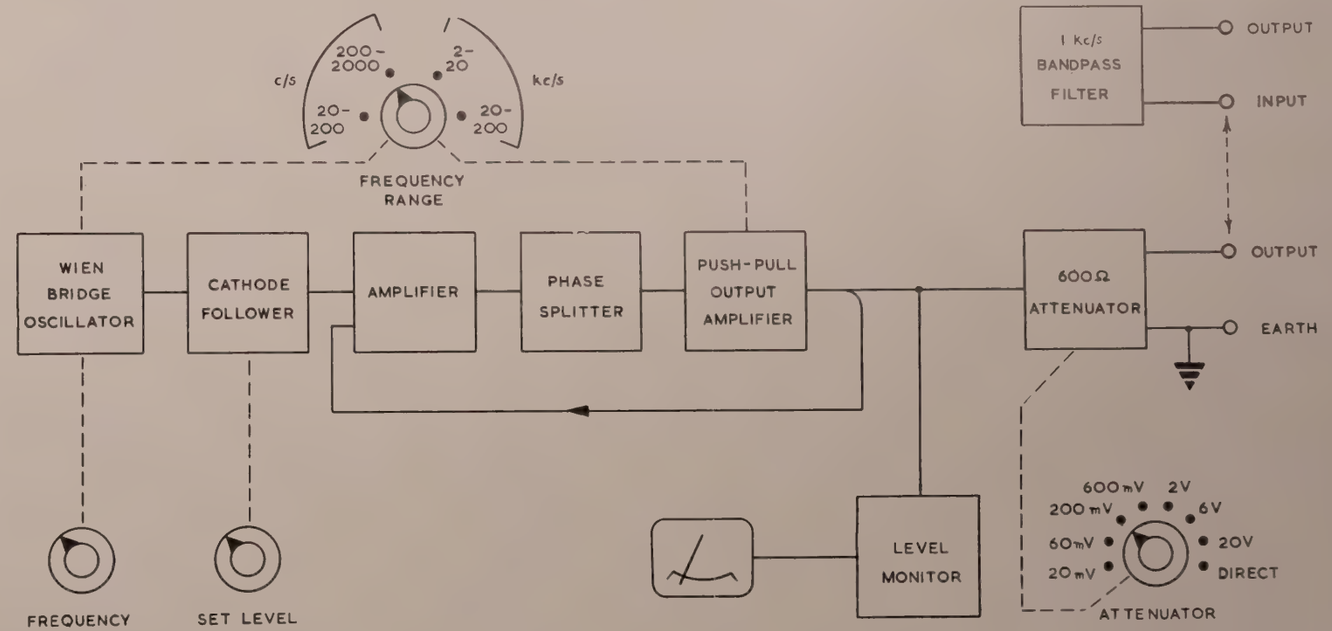
SOS Item No.	Circuit Ref.	Description	Works Ref.
		SWITCHES	
169	SA	Toggle, 2-pole, Change-over.	TB23903/2
170	SB	Rotary, 5-pole, 4-position.	TC4428/410
171	SC	Rotary, 2-pole, 8-position; including screen assembly.	77-TF1101
		KNOBS, AND DIALS	
172		Knob, for ATTENUATOR switch	TB17848/3
173		Knob , for RANGE switch.	TB17848/3
174		Knob, for SET LEVEL control.	TB17848/4
175		Kbob, for FREQUENCY control.	TB17848/4
176		Frequency Dial, blank.	TB4691A/9
177a		Window, for Frequency Dial.	TC25848/1C
178a		Centre Disc, aluminium alloy, behind Window, Item 177.	TC23983/2A

SOS Item No.	Circuit Ref.	Description	Works Ref.
		KNOBS AND DIALS (continued)	
179		Helical Spring, behind Centre Disc, Item 178	TB25849
180		Cursor, for Frequency Dial.	TC25848/2D
181		Support Spindle, captive at end of Frequency Dial shaft.	TE23099/9
182		Set Screw, retaining Support Spindle, Item 181, at end of dial shaft.	TB16022/7
183		Captive Screw and Washer, securing Items 177, 178, 179, and 180 to Item 181.	137-TF1101 TE18339/14
184		Frequency Dial Housing.	TE25249/1
		MISCELLANEOUS	
185		Front Panel.	TE25247/1
186		Reat Panel.	TE25247/2
187		Surround; to fir Item 185, or Item 186.	TD24786
188		Case Foot; to fit Item 187.	TA11420

SOS Item No.	Circuit Ref.	Description	Works Ref.
		MISCELLANEOUS (continued)	
189		Transparent Cover Plate, including Captive Screw; to fit Item 186.	TC26603/3 TB25040
190		Spring Clip, for stowage of mains lead; to fit Item 186.	158-TF1101
191		Side Cover, for left-hand or right-hand side.	TE25595/2B
192		Top Cover.	TC25686/1
193		Handle.	182-TF 1101
194		Handle Retainer; to secure Item 193 to Item 192.	TD25574/6A
195		Mains Voltage Tapping Panel.	TA21425
196		Reversible Reference Plate, for Item 195.	TA21484/1
197		Oscillator Screening Cover.	TD25250
198		Hexagonal wrenches for 2BA, 4BA, and 6BA socket set screws; in linen bag.	190-TF1101
199		Dummy Socket (on rear panel), for PL1.	TC23057/2
200		Operating and Maintenance Handbook.	EB 1101

BLOCK SCHEMATIC DIAGRAM

MARCONI INSTRUMENTS LIMITED							
DRN	A.B.R.	DATE	9/58	CHKD	A.B.R.	ISSUE	1
STOCK LIST	TF 1101		DRG No.	TLC 25314			



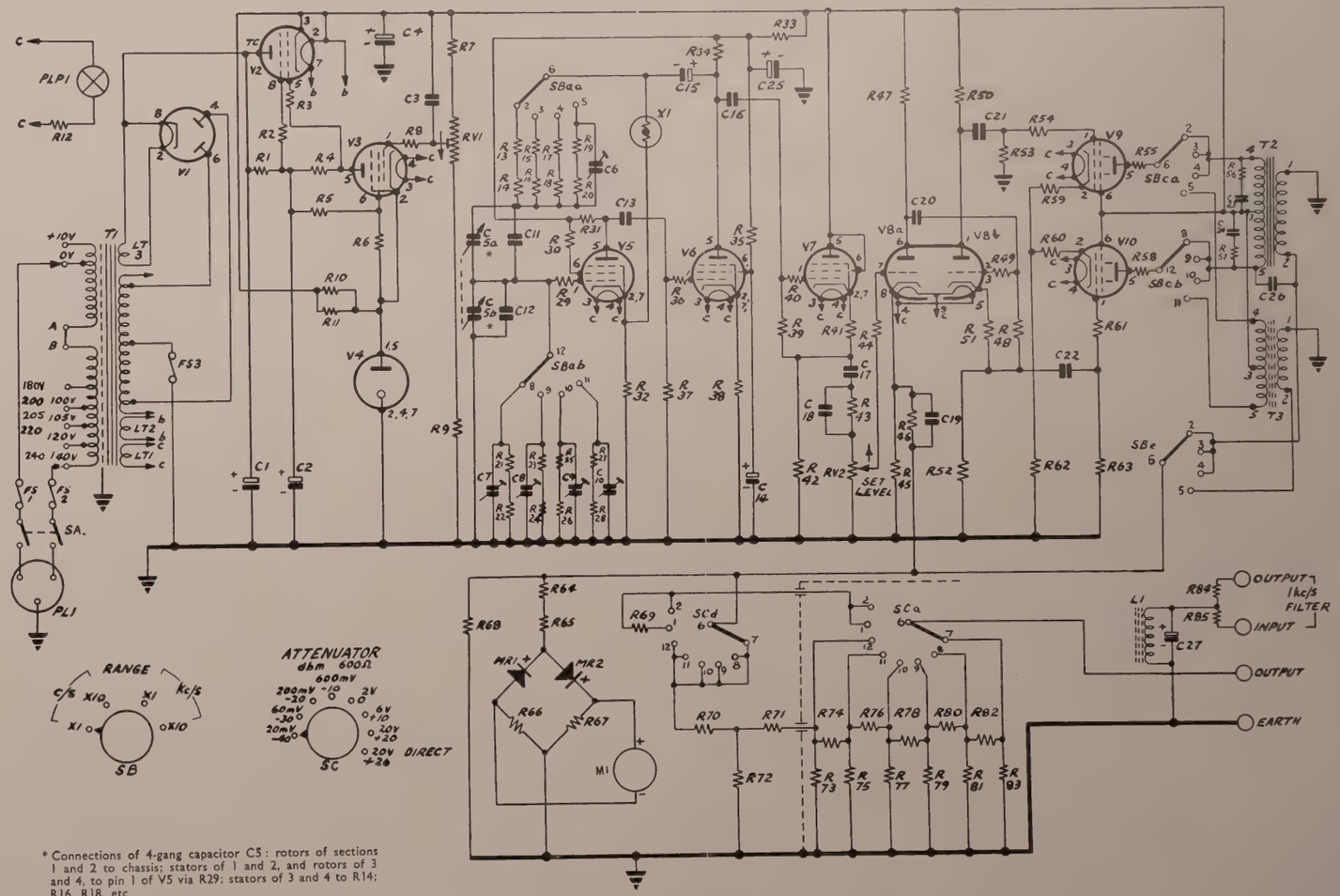
BLOCK SCHEMATIC DIAGRAM

TLC 25314

CIRCUIT DIAGRAM

(1) The resistor R11, shown in parallel with R10, is no longer fitted.

(2) An additional preset potentiometer RV3 has been added. It is connected across the LT1 winding of T1, and its sliding contact is connected to the anode of stabilizer V4.



* Connections of 4-gang capacitor C5 : rotors of sections 1 and 2 to chassis; stators of 1 and 2, and rotors of 3 and 4, to pin 1 of V5 via R29; stators of 3 and 4 to R14; R16, R18, etc.

CIRCUIT DIAGRAM

TLC 25246

MARCONI INSTRUMENTS LIMITED							
DRN	P.B.	DATE	10/55	CHKD	A.H.	ISSUE	4
STOCK LIST	TF 1101		DRG No.	TLC 25246			

DECIBEL CONVERSION TABLE

Ratio Down			*Ratio Up*	
VOLTAGE	*POWER*	*DECIBELS*	*VOLTAGE*	*POWER*
1·0	1·0	**0**	1·0	1·0
·9886	·9772	**·1**	1·012	1·023
·9772	·9550	**·2**	1·023	1·047
·9661	·9333	**·3**	1·035	1·072
·9550	·9120	**·4**	1·047	1·096
·9441	·8913	**·5**	1·059	1·122
·9333	·8710	**·6**	1·072	1·148
·9226	·8511	**·7**	1·084	1·175
·9120	·8318	**·8**	1·096	1·202
·9016	·8128	**·9**	1·109	1·230
·8913	·7943	**1·0**	1·112	1·259
·8710	·7586	**1·2**	1·148	1·318
·8511	·7244	**1·4**	1·175	1·380
·8318	·6918	**1·6**	1·202	1·445
·8128	·6607	**1·8**	1·230	1·514
·7943	·6310	**2·0**	1·259	1·585
·7762	·6026	**2·2**	1·288	1·660
·7586	·5754	**2·4**	1·318	1·738
·7413	·5495	**2·6**	1·349	1·820
·7244	·5248	**2·8**	1·380	1·905
·7079	·5012	**3·0**	1·413	1·995
·6683	·4467	**3·5**	1·496	2·239
·6310	·3981	**4·0**	1·585	2·512
·5957	·3548	**4·5**	1·679	2·818
·5623	·3162	**5·0**	1·778	3·162
·5309	·2818	**5·5**	1·884	3·548
·5012	·2512	**6**	1·995	3·981
·4467	·1995	**7**	2·239	5·012
·3981	·1585	**8**	2·512	6·310
·3548	·1259	**9**	2·818	7·943
·3162	·1000	**10**	3·162	10·000
·2818	·07943	**11**	3·548	12·59
·2512	·06310	**12**	3·981	15·85
·2239	·05012	**13**	4·467	19·95
·1995	·03981	**14**	5·012	25·12
·1778	·03162	**15**	5·623	31·62

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